

WHAT IS CLAIMED IS:

1           1.     Device for the correction of the power factor in power supply units with  
2 forced switching operating in transition mode, comprising a converter and a control  
3 device coupled with said converter so as to obtain from an alternating network input  
4 voltage a regulated voltage on the output terminal, said converter comprising a  
5 power transistor, said control device comprising a pilot circuit suitable for determining  
6 the switch-on time and the switch-off time of said power transistor, characterised in  
7 that said control device comprises control means coupled with said pilot circuit and  
8 with said converter and which are capable of prolonging said switch-on time period  
9 of the power transistor at the instants of time wherein said alternating network  
10 voltage substantially takes on the value zero.

1           2.     Device according to claim 1, characterized in that said pilot circuit  
2 comprises an error amplifier having a first signal at the inverting terminal input that is  
3 proportionate to said regulated voltage and a reference voltage on the non-inverting  
4 terminal, means for generating a ramp voltage signal comprising a capacitor, a first  
5 generator of a current signal suitable for loading said capacitor and a switch  
6 arranged parallel to the capacitor and commanded by said pilot circuit to discharge  
7 said capacitor, a comparator capable of comparing said ramp signal with an error  
8 signal from the output of said error amplifier and capable of providing an output  
9 signal suitable for determining said switch-on time period of said power transistor,  
10 said control means being coupled with said means for generating a ramp voltage  
11 signal so as to decrease the value of the load current of the capacitor at said instants  
12 of time wherein the alternating network voltage takes on a value that is substantially  
13 zero.

1           3.     Device according to claim 2, characterized in that said control means  
2 comprise a detector means suitable for extracting from a signal that is proportionate  
3 to the current that flows through said converter a rectified sinusoidal component with  
4 a period that is the same as half the period of the period of the network voltage, a  
5 second current generator coupled with said first generator and further control means  
6 which have at the input said rectified sinusoidal component and are capable of  
7 commanding said second current generator so as to decrease the value of the load

8 current of the capacitor at said instants of time wherein the alternating network  
9 voltage takes on the value zero.

1 4. Device according to claim 3, characterized in that said detector device  
2 extracts said rectified sinusoidal component from a signal that is proportionate to the  
3 current that flows through said power transistor.

1 5. Device according to claim 4, characterized in that said detector device  
2 is a peak detector of the current signal that flows through said power transistor.

1 6. Device according to claim 3, characterized in that said converter  
2 comprises a rectifying circuit of the network voltage, a capacitor arranged parallel to  
3 said rectifying circuit and an inductor arranged between said capacitor and said  
4 power transistor, and in that said detector device extracts said rectified sinusoidal  
5 component from a signal that is proportionate to the current that flows through said  
6 inductor.

1 7. Device according to claim 4, characterized in that said detector device  
2 comprises a low-pass filter and an amplifier.

1 8. Device according to claim 3, characterized in that said further control  
2 means comprise a limiter device suitable for selecting the central part of said  
3 rectified sinusoidal component at each half of said period of the network voltage and  
4 an inverter suitable for inverting the output signal from the limiter device and  
5 commanding said second current generator.

1 9. Device according to claim 3, characterized in that said further control  
2 means comprise a comparator capable of comparing said rectified sinusoidal  
3 component with a reference voltage and the output signal of which commands said  
4 second current generator.

1 10. Device according to claim 1, characterized in that said control means  
2 can be integrated in a chip with the pilot circuit of said control device.

1 11. A controller for regulating an output signal that a boost converter  
2 generates from a time-varying input signal, the boost converter having a power  
3 switch and the input signal having a crossover amplitude, the controller comprising:

4                   an error circuit operable to periodically activate the power switch for an  
5 on period that is related to the output signal; and  
6                   a distortion-reducing circuit coupled to the error circuit and operable to  
7 lengthen the on period while the input signal is within a predetermined amplitude  
8 range.

1           12.    The controller of claim 11 wherein the error circuit comprises:  
2                   a first comparator operable to generate an error voltage that is related  
3 to the output signal;  
4                   a capacitor;  
5                   a current source operable to charge the capacitor; and  
6                   a comparator operable to activate the power switch while a voltage  
7 across the capacitor is less than the error voltage.

1           13.    The controller of claim 11 wherein:  
2                   the error circuit comprises:  
3                           a first comparator operable to generate an error voltage that is  
4 related to the output signal,  
5                           a capacitor,  
6                           a current source operable to charge the capacitor, and  
7                           a comparator operable to activate the power switch while a  
8 voltage across the capacitor is less than the error voltage;  
9                   the on period begins substantially when the current source begins  
10 charging the capacitor; and  
11                   the on period ends substantially when the voltage across the capacitor  
12 equals the error voltage.

1           14.    The controller of claim 11 wherein:  
2                   the error circuit comprises:  
3                           a first comparator operable to generate an error voltage that is  
4 related to the output voltage,  
5                           a capacitor,  
6                           a first current source operable to charge the capacitor,  
7                           a comparator operable to activate the power switch while a  
8 voltage across the capacitor is less than the error voltage, and

9 the distortion-reducing circuit comprises a second current source  
10 operable to discharge the capacitor while the input signal is within the amplitude  
11 voltage range.

1 15. The controller of claim 11 wherein the predetermined amplitude range  
2 includes the crossover amplitude.

1 16. The controller of claim 11 wherein the predetermined amplitude range  
2 is centered about the crossover amplitude.

1 17. A power supply, comprising:  
2 a boost converter having a power switch and operable to generate an  
3 output voltage from a time-varying input voltage signal; and  
4 a controller coupled to the converter and including,  
5 an error circuit operable to regulate the output voltage by  
6 periodically activating the power switch for an on period that is related to the  
7 output voltage, and  
8 a distortion-reducing circuit coupled to the error circuit and  
9 operable to lengthen the on period while the input voltage signal is within a  
10 predetermined voltage range.

1 18. An electronic system, comprising:  
2 a power supply that includes,  
3 a boost converter having a power switch and operable to  
4 generate an output voltage from a time-varying input voltage signal, and  
5 a controller coupled to the converter and including,  
6 an error circuit operable to regulate the output voltage by  
7 periodically activating the power switch for an on period that is related  
8 to the output voltage, and  
9 a distortion-reducing circuit coupled to the error circuit and  
10 operable to lengthen the on period while the input voltage is within a  
11 predetermined voltage range.

1 19. A method, comprising:  
2 generating an output signal from a time-varying input signal;

3 regulating the output signal by periodically drawing current through an  
4 inductor for an on period that is related to the output signal; and  
5 lengthening the on period while the input signal is within a  
6 predetermined amplitude range.

1 20. The method of claim 19 wherein lengthening the on period comprises  
2 lengthening the on period while the input signal is within a predetermined amplitude  
3 range that includes zero amplitude.

1 21. The method of claim 19 wherein lengthening the on period comprises  
2 periodically drawing the current through the inductor by closing a switch for the on  
3 period.

1 22. The method of claim 19 wherein:  
2 the output signal comprises an output voltage signal;  
3 the input signal comprises an input voltage signal; and  
4 the predetermined amplitude range comprises a predetermined voltage  
5 range.